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Joint Theater Logistics: An Advanced Concept Technology Demonstration (ACTD)

The Joint Theater logistics ACTD team has taken an innovative approach to empower both operators and logisticians to collaborate at the operational level of war from disparate locations via the Web, using a commercial browser to orchestrate planning, execution, monitoring, and re-planning of military logistics operations. The result was the Joint Theater Logistics program.

We created an environment for both synchronous and asynchronous collaborative command and control. That's the ability to plan where forces will or should be; evaluate the current situation; give direction to alter the disposition or other attributes of the force, including mission, place, location and intent, and alter the intended outcome; and verify or assess the results of that change.

Every warfighter knows these are essential elements of successful operations. But if we look at the other word, "collaborative," things get very murky, very fast. Doesn't it seem like every advertised, off-the-shelf product will somehow provide a "collaborative" solution?

Most references to collaboration refer to computers, not people. We all understand teleconferencing, where people exchange verbal ideas, and we understand video conferencing where people share images. JTL approaches the human side of collaboration where we couple the audio and video while sharing underlying information and data.

Why is this so unique? JTL allows the user to share visualizations selectively. When the operator wants to share his plan with the logistician, he selects a portion of his data, visualizes it along with written comments or sketches, and sends it via the Internet to share with others. But what is received is not just an image. Every data point remains linked to the underlying data. Not only do both collaborators see the same data simultaneously, they each can manipulate it and drag it out to their own analysis tools.

Underlying this approach is a rich visualization framework based on a well-defined information architecture that permits and enhances the sharing not only of data, but of the user-developed inferences of data that create information. Creating an information architecture achieves two profound effects for users.

First, it creates information liquidity. It overcomes information stovepiping, limiting it to a single channel, application, or organization. Users can think about the information and how they can use it, change it, and analyze it rather than thinking about what software they must run to get at each type of information.

Second, the information architecture changes the user interface design of work environments. When all user interfaces are layered on an information architecture, the information, not the system, provides the skeleton that shapes how user interfaces are structured and appear. While this new collaborative and visualization framework was designed by MAYA Viz, the success of the JTL has come from the acceptance and integration of this framework by all of the development team members. This architectural view of information has freed us from the constraints of traditional development programs bounded by system and user interface architectures. The former specifies how software components and functions are assembled as well as product applications and functions, such as loading data into databases and fashioning queries to retrieve, reorganize, and aggregate results to present to a user.

The latter, user interface architecture, is that portion of software that allows people to interact with their information, but it usually implies a further limitation—stovepiping—that limits user interaction to pre-stored queries or processes that limit information liquidity. Our approach supports something we call "decision communities"—groups of people using interactive visualization tools to assist with the development, analysis, execution, and monitoring of courses of action so community members can make informed, effective, and timely decisions. The decision community includes two or more clients (displaying tables, maps, etc.), a repository server and information sources. The repository server provides communication

among clients and their information. The clients access information through "appliances"—visualization components with custom controls and some basic business logic. If a group of appliances are connected by more detailed business logic, they are a "container."

JTL consists of many different appliances and several containers, all accessed through the workspace. The workspace is central to the decision community because it is the palette that allows the dragging and dropping of custom views of information. It is the universal currency of information in a decision community between appliances. Dragging and dropping is how appliances communicate with each other.

As an example, imagine two visualization clients performing this rich collaboration on the development of a course of action, or COA. Both clients have the same COA container open and are collaborating on the development of an action. The first client, the joint task force operator, drags and drops forces available to the planners from the global forces palette into the proposed course. The second client, an Army commander, sees the newly added forces and drags and drops a unit into the task force appliance and creates a new task force ready for deployment. Another client, Army operations and training (G-3), sees the new task force and now drags and drops it on the map. As the G-3 places the new task force on the map, the Army commander has activated a force editor appliance to drill down on data for the lead unit in the task force and proceeds to adjust the committed equipment totals.

All three clients viewing the same COA container receive any update performed by any collaborating client. These are just a few of the user interface behaviors in the workspace and how collaboration is performed. It also gives a good insight to the way users interact to modify both the visualization and the content of the underlying information.

Collaboration in the decision community is accomplished by shared content, shared markings, and shared blueprint.

Shared content is the coordination between clients of the objects in an appliance. For example, two clients are working on a generic map appliance. One client, the Army G-3, drags and drops a new object of a unit on to the map. The other client, the Army logistics element (G-4), sees the object as it is placed on the map and can drill down to see the details of this new object and its support requirements, thereby collaborating on the underlying content.

Shared markings is the coordination between clients of inking and object colors. In this example, again the two same clients are collaborating on the same generic map appliance, the blueprint on the palette. This time, each client is drawing lines and dragging and dropping graphics, in near real time, on the map. These graphic objects and inkings are permanent until erased by one of the clients.

Both clients may select and change the color identifying previously-positioned units. In this example, the G-3 has activated the flashlight tool and highlights a specific area on the map. He uses this collaborative aid to show the other client, the G-4, where to place a new supply point. When the G-4 positions the supply point the G-3 releases the flashlight and that inking disappears from the map. Now G-4 has dragged and dropped a sticky on the map. He uses this to annotate the map with information about an incident, in this case the fact that an airbase runway was damaged and to give details about operations at this facility have been affected. The G-3 sees the sticky, does a mouse over to see the title and then opens it to see the details.

Shared blueprint is the coordination of an appliance's properties. Again, G-3 and G-4 share the same generic map. This time, the G-4 decides to zoom out on the map while the G-3 pans to the right. While they are looking at different sections of different maps, both still see the same geo-registered content and markings. These three key qualities define the "deep" or 3-dimensional collaboration available in JTL and differentiate it from other collaboration tools. All of the capabilities are available in JTL and have been used successfully by warfighters from Pacific Command, Central Command, European Command, and Joint Forces Command during a recent exercise; as well as by the National Guard, fire, and police organizations in a recent Homeland Defense demonstration.

The JTL program has moved forward since then to improve the performance and persistence of the technologies so it can operate on lower bandwidths with higher reliability. We are adding enhancements growing from user feedback from our exercises. They include map thumbnails (picture in picture), smart shapes, densities, object filters, and user-defined map overlays for objects and markings. All of this will be delivered before the program ends in December.

Thank you.